## I BULLETIN BROXHNF

BROOKHAVEN NATIONAL LABORATORY

# New BNL Method for Sequencing DNA May Expedite Human Genome Project

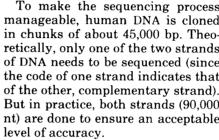
Using statistics and a twist on existing molecular biology techniques, Bill Studier, Senior Biophysicist in the Biology Department, is working on a new method of determining the sequence of the nucleotide components of human deoxyribonucleic acid (DNA).

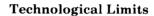
Human DNA molecules contain 3 billion pairs of complementary to meeting the 15-year target within a reasonable budget.

Working with Studier to test the new method, which he hopes to see ready within the next year, are Senior Biochemist John Dunn and Biology Associates Willie Crockett and Kathy Griffin of BNL, and summer students Jack McNulty from Southampton College and Bobby Walker from the and that's what a primer does."

A primer is a short string of nucleotides manufactured to be complementary to a particular, known sequence in the template strand. DNA polymerase then extends the chain by adding nucleotides to the primer in one direction. Special nucleotides, called terminators, allow the sequence of the new chain to be "read" as a series of black lines when subjected to a process known as gel electrophoresis.

To make the sequencing process manageable, human DNA is cloned in chunks of about 45,000 bp. Theoretically, only one of the two strands of DNA needs to be sequenced (since the code of one strand indicates that of the other, complementary strand). But in practice, both strands (90,000 nt) are done to ensure an acceptable





The primary limitation of sequencing technology, however, is that gel electrophoresis can read only 500 nucleotides (nt) of sequence from a single primer. To sequence 90,000 nt, then, requires a minimum of 180 primed sequencing reactions.

A batch of primer costs about \$50 to synthesize, but enough material is produced for a million sequencing reactions. To take advantage of this capacity, the current sequencing strategy is to break the 45,000-bp chunk into many smaller clones, each of which is placed next to the same priming site. In this way, a single preparation of primer can be used over and over again to sequence many DNA fragments.

However, because the fragments are broken randomly from the unmapped 45,000-bp chunk, the same block is often sequenced more than once, or parts of two blocks overlap.

"If done this way," says Studier, 'in the early stages when you randomly choose a piece to sequence, you will almost always get a new piece; but in the later stages you are more likely to get a piece you've already done."

A computer is used to determine the exact order of the chunks by finding overlaps between them; about ten times the minimum number of sequencing reactions must be performed to disclose the complete sequence of both strands.



containing primers — which appear as strips of dark bands to analyze their purity. Behind him is the machine used to manufacture pri-

**Bill Studier** 

examines a gel

Photos on this page by Roger Stoutenburgh.

nucleotides, called base pairs (bp). "With current technology it's hard for one person to sequence 45,000 base pairs in one year," says Studier. "And even if one person could do that much in a day, it would take 300 years to sequence the entire human genome."

Studier's work is part of the new Human Genome Project, a program funded partially by the U.S. Department of Energy (DOE) to map the exact structure of human DNA over a 15-year period. His new method proposed in a paper in last October's Proceedings of the National Academy of Sciences - could be crucial State University of New York College at Geneseo.

#### The Basics of Sequencing

Both the current DNA sequencing method and the one Studier proposes are based on the natural process of DNA replication. In this process, an enzyme called DNA polymerase assembles nucleotides to complement one strand of the double-stranded DNA helix. This single strand is referred to as the "template" (see Figure 1).

Another ingredient, called a primer, is also required for sequencing. "DNA polymerases don't start chains by themselves — they only extend chains," says Studier. "We must give them a chain to extend -

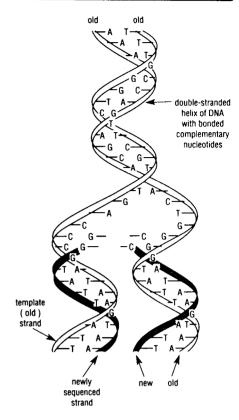


Figure 1. DNA replication. The four nucleotides, whose sequence codes for the production of proteins, are: A = adenine; T = thymine; C = cytosine; G = guanine. Template nucleotides can code for nucleotides of the new strand because nucleotides always pair with their complement: A with T and C with G.

Studier's proposal is an improvement upon a method called "primer walking," which employs more primers but avoids useless repetition of sequence. Starting with a cloned template 45,000-nt long, a section of 500 nt is sequenced using a primer to one end; then a new primer is made complementary to an end section of the now sequenced 500 nt. Using that primer, a new 500-nt section is sequenced in another reaction, and so on (see Figure 2).

Sequencing by this method moves in orderly 500-nt sections down the template, eliminating useless extra sequencing but requiring at least 180 different primers, a considerable expense.

One problem with primers is that the smaller ones may pair with more than one area on the template. If priming occurs in more than one place on the same template, the sequence is unreadable. To avoid this problem, conventional primer walking employs primers that are 15- to 20-nt long; an exact complement to a primer of this length is expected to occur so rarely on template DNA that each primer could be used only once in the whole human genome.

But this specificity means many costly primers will have to be made to sequence human DNA. So Studier used statistical analysis to determine the size of primer specific enough to produce readable sequence from a (continued on page 2)

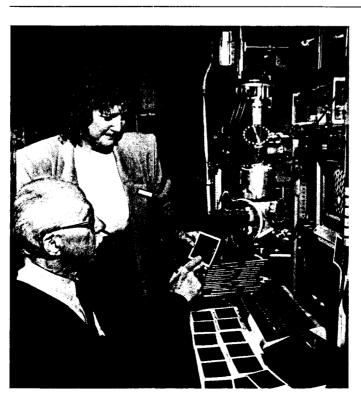
### **Inside Info**

Robert Bari, Deputy Chairman of the Department of Nuclear Energy. has been elected the Vice Chair/ Chair Elect of the Nuclear Reactor Safety Division (NRSD) of the American Nuclear Society (ANS). His oneyear term began in June.

Last month, Bari also began a oneyear appointment as Chairman of the ANS Planning Committee, of which he has been a member since 1984.

Last year, Bari served as NRSD secretary/treasurer and vice chairman of the ANS Planning Committee. In the past, he has served the NRSD as Program Committee Chairman, Division Representative, Executive Committee member, liaison to Standards Steering Committee, and Technical Program Committee member for several topical meetings.

From 1982-85, Bari was a member of the ANS Committee on the Nuclear Regulatory Commission's Safety Goal Policy Statement. In 1981, he served as Technical Program Co-Chair of the ANS-European Nuclear Society's Topical Meeting on probabilistic risk assessment.



## **Learning About the Lab**

Nancy Milton, Budget Examiner for the federal government's Office of Management and Budget, recently spent a day at BNL touring major facilities and talking to staffers about the Lab's multidisciplinary programs. In this photo, taken at the Scanning Transmission Electron Microscope in the Biology Department, Milton and BNL Associate Director Richard Setlow discuss the Lab's involvement with the U.S. Department of Energy's Human Genome Project, as well as the Medical Department's program in boron neutron capture therapy. Milton reviews and recommends budget levels for science programs at DOE national labs.

## Sowing Their Wild . . . Flowers

While biking or walking on the BNL grounds this summer you may have come across one: an area that looks like unmown grass from a distance, but upon closer inspection reveals hundreds of colorful, nodding wild-

This pleasant surprise is the work of Site Superintendent Roy McWilliams and Grounds & Sanitation Supervisor Tage Carlsson, both of the Plant Engineering Division. For two summers now, they have experimented with planting wildflowers on

"We wanted to reduce the amount of grass we have to cut," explains McWilliams. "Everytime we clear a piece of land for one reason or another we end up with more lawn, but there's no adjustment to the number of employees or the amount of money we get for the new lawn we have to

Not enough flowers have been planted yet to cut back noticeably on the mowing; nevertheless, McWilliams and Carlsson can't contain their enthusiasm for the project. "We're really happy with the way the colors in each field really change over the course of the year — the fields aren't static," says McWilliams.

And once each plot is tilled, fertilized and seeded, the wildflowers need little watering or other maintenance.

Carlsson and McWilliams started this project late last summer with a field on Grove Street near the Supply & Materiel Division. "But the soil wasn't very good and a lot of seed washed down into the railroad tracks," says McWilliams.

Five sites are in bloom now: the Grove Street plot; one on Rochester Street across from the service station, on what was once an experimental cornfield run by the Biology Department; another directly behind the Biology building, in a recently

regraded area; one in front of the Chilled Water Facility, also on Rochester; and a plot near the front

As other areas on site are cleared or altered, they may become candidates for further wildflower plantings. McWilliams and Carlsson are now eyeing some of the mowed acreage near the apartments.

Carlsson uses a Northeast wildflower mixture sold by a wildflower and specialty seed company. The mixture includes both annuals for quick color early in the season, and perennials, which bloom later in the summer and, unlike annuals, reseed themselves every year.

Right now, the plot near the gas station is ablaze with the intense yellows of plains coreopsis, lanceleaved coreopsis and black-eyed susan, while the field across the street from it is dotted with the soothing blues, lavenders and pinks of cornflowers.

But what seems like a separation by floral personality, says Carlsson, is actually an unplanned result of the natural tendency of heavier seeds to come out of the seeder first. Depending on how sowing is performed, then, the seeds are naturally segregated into different fields.

The wildflower mix also includes prairie coneflower, the diminuitive ox-eye daisy, cosmos, chicory, bright yellow and red Indian blanket, and the flat heads of white - or in rare cases pink - yarrow. Earlier in the summer the dainty magenta catchfly and the light orange California poppy were more in evidence.

Carlsson says he's happy with the seed mix, but is looking around for a local seed company, and one that can provide an alternative to the grass that now grows among the

"When you look at the fields you

A young visitor to the Lab takes a moment to admire one of five fields of wildflowers now planted on site. Please enjoy, but do not pick, the wildflowers.

Photos on this page by Roger Stoutenburgh.

see a lot of flowers but also a lot of tall brown grass - so we're trying to find some kind of low-growing ground cover to put in so the flowers will stand out more." he says.

McWilliams and Carlsson ask eve-

ryone to resist the temptation to pluck a few blooms. "We'd prefer people not to pick the flowers for a few years until the they get a chance to establish themselves," McWilliams explains. — Lisa O'Rourke

**DNA Sequencing** (cont'd) template, but common enough to be used on many different 45,000-bp chunks.

Studier explains that there are 49, or about 262,000 possible "nonamers," primers nine nt long. "Statistically, any given nonamer will occur only in one place in a block of 90,000 nt," Studier explains. "If you turn it around, any nonamer will occur once every three blocks of 90,000 nt. So if you're sequencing a long molecule like human DNA, you can start using that primer over and

The reusability of nonamers makes the new technique economically feasible. Another statistical fact that makes this method attractive, says Studier, is that a primer "library" of about 10,000 of the 262,000 possible nonamers would be sufficient to sequence the human genome.

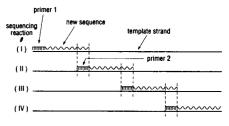


Figure 2. Primer walking. A primer for the second reaction pairs with an end section of the portion sequenced in the first reaction, thus moving in an orderly fashion down the 45,000nt template.

In tests so far, Studier has found conditions in which some nonamers will prime accurately on 45,000-bp templates. The task at hand, he says, is to establish conditions where all nonamers in a large library will consistently prime reliably.

'The best thing about this method is that it builds on things we already know will work," says Studier. Once a primer library is established, he says, "this method will decrease the time and labor involved in sequencing by a factor of 10 or more compared to the current method. And though the cost of sequencing is now about \$2 per base pair, this technique could reduce it to maybe 2¢ per base pair." -Lisa O'Rourke

Fox Family Bluegrass

Friday, August 3

8 p.m., Berkner Hall

Tickets cost \$6 each.

#### Summer **Bluegrass** Concert

**Buy tickets at the BERA Sales** Office, 9 a.m.-2 p.m., or the Recreation Office, Bldg. 185, after 2 p.m., or from Rick Backofen, Bldg. 197B; Michelle Cummings, Bldg. 459; Elizabeth Pergan, Bldg. 179A; Jean Ramirez, Bldg. 197C; Maryann Reynolds, Bldg. 703; Sharon Smith, Bldg. 510A.

## At the Lab: Nurturing Long Island's Lupines

For the past few months, BNL has been the site of a modest but ecologically important project to boost the population of a flowering plant native to Long Island, the wild blue lupine.

Karen Blumer, ecologist and former BNL employee, is working with BNL's Plant Engineering Division to cultivate the lupine, Lupinis perennis, at experimental plots on site. These spires of violet-blue blossoms grow here naturally, but in recent years the population has dwindled; elsewhere on Long Island, the pine barrens habitat of the lupine has rapidly been destroyed by

"The lupine used to be abundant on site," recalls Blumer, who is the author of a new book, Long Island Native Plants for Landscaping, a Source Book. "When I worked at BNL from 1977-80, there were big beautiful meadows of blue. But over the years I've noticed the population of lupines on site has grown smaller and smaller."

So Blumer, who also works on the Open Space Council's Native Plant Habitat Renewal Project, collaborated with the Lab's Plant Engineering Division under Site Superintendent Roy McWilliams to augment the existing lupine population. Dolly Johnson, a tool crib attendant from Plant Engineering, was assigned to help with the project.

McWilliams says he was happy to work with Blumer because, "We're all basically interested in preserving as much of the existing game and foliage on site as possible - and in keeping up with the trend for environmental concern.'

Using seeds collected from existing lupines, which bloom in early June, Blumer and Johnson planted two small pilot plots: one of 12 seeds and one of nine. Blumer has also propagated six seeds from the BNL stock at home, and will soon plant the seedlings on site.

Johnson visits the plots periodically to check the plants' progress. Blumer and Johnson also marked the parent plants so they could track their survival over the years.

"The Lab is the perfect place for this project because it is an original site for the plant, and we can control the traffic in the planting areas," Blumer points out. She says the sunny fields with sandy soil common to the Lab are just what this stately member of the pea family loves.

Blumer isn't sure why the population here began to dwindle: She says it may be due to a change in road or grounds maintenance practices, or to a natural fluctuation in the plant population.

"But Roy McWilliams has been very cooperative about cordoning off these areas so people wouldn't walk there, and providing other assistance," she says. "And if we are able to propagate enough plants from seed, we've talked about introducing it to other areas on site.

- Lisa O'Rourke



Examining the wild blue lupines they have planted in a pilot project to augment the on-site population of these native wildflowers are Karen Blumer (left), ecologist and former BNL employee, and Dolly Johnson, Plant Engineering, who is assisting Blumer with the project.

# Swimarathon '90 — Sign Up ASAP

Both swimmers and helpers are needed at the BNL 'ool for Swimarathon '90, sponsored by the Brookhaven Employees Recre-



ation Association (BERA) to benefit the Amercian Cancer Society (ACS). The reward for doing a job well swum for this good cause will be not only a good feeling, but also an ACS Tshirt.

On Saturday, August 4, individual swimmers and teams of up to 12 members are needed to put in as many laps as they can between 9 a.m. to 9 p.m. — with rests allowed between sets of laps. After signing up sponsors to pledge for each length of BNL's 33.3-yard pool swum, swimmers will earn tax-deductible contributions to the ACS.

Helpers are needed to check-in swimmers, count their laps, and assist with entertainment and refreshments.

So sign up as soon as possible, using forms available at the pool, Bldg. 478; the BERA Sales Office, Berkner Hall; or the Recreation Office, Bldg. 185.

#### **Software Demo**

Representatives of Viewlogic will present their design system, consisting of schematic entry, logic and mixed mode simulation, and development simulation through VHDL. The demonstration wil be presented on a Sun SPARCstation in the seminar room of Bldg. 515, Computing & Communications Division, Wednesday, July 25, at 10 a.m. For more information, call Pam Mansfield, Ext. 7286.

### **Hospitality News**

On Monday, July 23, at 9:30 a.m. in the Brookhaven Center, the Hospitality Committee will hold a gettogether to bid farewell to three Committee members who served as representatives for the on-site apartment area and who are leaving the Laboratory this month. All committee members and residents of the on-site apartments are invited to attend. Coffee, tea and danish will be provided. Come and bring the children; babysitting will be provided free of charge.

### In Addition

Due to space requirements in last week's Bulletin article on the D0 experiment, many people who have worked hard on the experiment over the years were not mentioned. We regret the omission of: Eugene Hassell, Martin Howard, John Koehler, Sal Marino, Mordecai Montag and Richard Ruggiero, who made significant contributions to the D0 central calorimeter; John Featherly, who works on D0 software; Steve Adler and Pat Meehan, who maintain the D0 program library.

## BROOKHAVEN BULLETIN

Published weekly by the Public Affairs Office for the employees of BROOKHAVEN NATIONAL LABORATORY

ANITA COHEN, Editor
MARSHA BELFORD, Assistant Editor

LIZ SEUBERT, Reporter

35 Brookhaven Ave., Upton, N.Y. 11973 (516) 282-2345 **Golf Tournaments** 

The fourth 1990 BGA Golf Tournament will be held Tuesday, July 31, at the Swan Lake Golf Club under stroke-play rules. Call Bob Lofaro, Ext. 7191, to arrange a tee-off time. Tee-times run from 10 a.m. to about 12:30 p.m., depending on the number of people signed up.

Greens fees are \$21, and riding carts are \$24. Sign-up deadline is July 27. All callers are encouraged to have a complete foursome prior to calling. In the event of rain, direct questions to the Pro Shop, 369-1818.

Sixty-seven golfers participated in the third BGA outing of the year at the Timber Point Golf Club. Winners were:

Flight	Gross	Net
Α	John Millener	Vinny Racaniell
В	Joe Klemish	Jim Desmond II
$\mathbf{C}$	Mike Clancy	See-Meng Wong
D	Andy Warkentien	Mike Buckley

Also, prizes went to Bob Mills and Young Park for long drives, and Mike Clancy and John Usher took closestto-the-pin awards.

#### **Aviation Club**

Unflighted — Uwe Bergman

The BERA Aviation Club will make a flying trip to Nantucket Island on Tuesday, July 24. Anyone interested should contact Lou Addessi, Ext. 4672. Rain date is Tuesday, July 31.

#### **Radio Club**

The Amateur Radio Club will meet in Berkner Hall, Room A, on Thursday, July 26, at noon. The agenda includes a discussion of club business and upcoming club activities.

All licensed radio amateurs employed at the Lab, those wishing to obtain amateur radio licenses, and Lab guests are invited to attend. For more information, contact Andy Feldman, Ext. 3264, or Bob Bacharach, Ext. 7790.



#### On the Menu

At the Cafeteria				
Monday, July 23				
Soup: Hot & sour	.75/.95			
Entree: Chinese chicken & broccoli				
over rice w/veg.	3.10			
Entree: Veal Parmesan w/veg.	3.10			
Fitness: Pasta primavera w/veg.	3.10			
Carvery: Hot pastrami sandwich	2.85			
Tuesday, July 24				
Soup: Split pea	.75/.95			
Entree: Roast pork loin, natural gravy				
w/1 veg.	3.10			
Entree: Stuffed green peppers w/1 veg	. 3.10			
Fitness: Seafood linguini w/1 veg.	3.10			
Carvery: Hot roast beef sandwich	2.85			
Wednesday, July 25				
Soup: Cream of carrot	.75/.95			
Entree: Chicken Dijon w/1 veg.	3.10			
Entree: Jambalaya w/1 veg.	3.10			
Fitness: Chef's special	3.10			
Carvery: Hot Black Forest				
ham sandwich	2.85			
Thursday, July 26				
	.75/.95			
Entree: Home-style meat loaf w/1 veg.	3.10			
Entree: Chicken cacciatore				
w/spaghetti & l veg.	3.10			
Fitness: Baked potato w/broccoli				
cheese sauce	3.10			
Carvery: Hot corned beef sandwich	2.85			
Friday, July 27				
Soup: Seafood bisque	.75/.95			
Entree: Fish 'n chips w/1 veg.	3.10			
Entree: Pasta w/meat sauce & 1 veg.	3.10			
Fitness: Chef's special	3.10			
Carvery: Hot turkey sandwich	2.85			
Breakfast w/coffee, 7:30 - 10:30 a.m.	2.65			
Man . 9				

Mon.: 2 eggs, bacon & pancakes
Tue.: Western omelet, French fries, toast
Wed.: Spanish omelet, home fries, toast
Thu.: 2 eggs, bacon, cheese on croissant, fries
Fri.: French toast, 2 eggs, bacon, home fries

## **Bound to Have Fun!**



All sorts of fun for kids and adults — that's the program planned for the BERA 1990 Food & Fun Picnic on Saturday, August 25 (rain or shine). The planners are committee members from BERA's Afro-American Culture Club, Social Club and Special Events Committee, who have combined forces to arrange for a friendly, relaxed day with enjoyable food — and no dishes!

Uncle Marty and his team, who have successfully catered earlier Lab picnics, will be cooking burgers and hot dogs to serve with different salads. Soda and beer will be on tap, and ticket holders will have nothing to do but decide whether to start dancing, compete in the extraordinary sports and races of the Fun Olympics, go for a face-painting session with a clown — or just wander around and talk to friends.

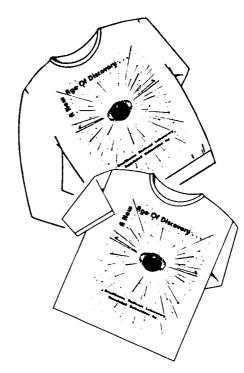
Tickets at \$10 each are on sale until August 17, from the BERA Film Store; or from Michelle Cummings, Bldg. 459, Ext. 2077; Kay Dellimore, Bldg. 185, Ext. 2873; Liz Mogavero, Bldg. 510, Ext. 3940; Betty Pergan, Bldg. 179A, Ext. 2937; Rosalie Piccione, Bldg. 355, Ext. 3160; Barbara Simpson, Bldg. 355, Ext. 7187; and Doris Terry, Bldg. 179C, Ext. 7610. To join in the Fun Olympics, contact Mogavero or Pergan.

## Summer T-Shirts And Sweatshirts

Good news for anyone who still wants to order "A New Age of Discovery" BNL T-shirt or sweatshirt: The deadline has been extended through August 17.

The heather-gray shirts have multicolor printing. Made of 50% cotton and 50% polyester, they are available in unisex adult sizes (small, medium, large, extra large) and unisex children's sizes (small, medium, large). Tshirts cost \$6 each, and sweatshirts are \$12 each; prices include tax.

Each order must be accompanied by cash or money order made payable to "Renée Flack, Shirts '90." No personal checks, please. Orders and payments can be mailed to T-Shirts, Bldg. 179, or brought to the BNL mailroom, Bldg. 179. Allow two weeks for delivery.



#### **Arrivals & Departures**

Arrivals

Diane C. Dehler	Personnel
Shelley A. Landon	
Sunil K. Sinha	Physics

Departures

This list includes all employees who have terminated from the Lab, including retirees:

Philip M. Johnson	Chemistry
Erkki L. Soininen	Physics
Janet P. Soper	Sup. & Mat'l

#### Classified Advertisements

#### **Placement Notices**

The Laboratory's placement policy is to select the best-qualified candidate for an available position, with consideration given to candidates in the following order of priority: (1) present employees within the department and/or appropriate bargaining unit, with preference to those within the immediate work group; (2) present employees within the Laboratory as a whole; and (3) outside applicants. In keeping with the Affirmative Action plan, selection decisions are made without regard to age, race, color, religion, national origin, sex, handicap or veteran status.

national origin, sex, handicap or veteran status. Each week, the Personnel Office lists new personnel placement requisitions. The purpose of these listings is, first, to provide open placement information on all non-scientific staff positions; second, to give employees an opportunity to request consideration for themselves through Personnel; and, finally, for general recruiting purposes. Because of the priority preference policy stated above, each listing does not necessarily represent an opportunity for all candidates. As a guide to readers, the listings are grouped

according to the anticipated area of recruitment. Except when operational needs require otherwise, positions will remain open for one week following publication date.

lowing publication date.
For further information regarding a placement listing, contact the Employment Manager, Ext. 2882.

The vacancies listed below have been exempted by the Director's Office from the current freeze on open requisitions.

**LABORATORY RECRUITMENT** - Opportunities for Laboratory employees only.

4284. RESIDENT SERVICES SUPERVISOR - Responsible for first-line supervision in the resident services section of Laboratory visitor housing. Directs housing custodians on jobs, including assignment, training, scheduling, grievance handling and technical direction. Maintains records and prepares reports. Staff Services Division.

(continued on page 4)

**OPEN RECRUITMENT** - Opportunities for Laboratory employees and outside applicants.

4285. ENGINEERING POSITIONS - (Quality Assurance - 3 openings) Requires a bachelor's degree in science or engineering and a minimum of 10 years quality assurance experience, including five years of managerial experience. Responsibilities will include establishing quality assurance programs for R&D projects, training personnel in the implementation of these programs, auditing, problem investigation, and verification of corrective action. Computer knowledge is highly desirable. Director's Office.

4286. TRAINING SPECIALISTS (3) - Requires BA/BS in instructional technology or several years' experience as an instructor at a nuclear reactor facility. Must be able to design, develop, conduct and evaluate general employee, emergency planning and other technical training programs. Familiarization with INPO guidelines and/or DOE accreditation requirements and reactor operator certification are desirable. Good communication skills and experience with computers necessary. Must be able to obtain and maintain a security clearance. Reactor Division.

4287. TECHNICAL POSITION - Requires AAS in mechanical technology or equivalent and previous experience with high-pressure gas, vacuum and cryogenic technology. Previous electronics experience desired. Will be required to qualify and maintain facility operating qualification through written exams. Duties will include helium leak testing, operation and maintenance of high-speed rotating equipment at the HFBR Cold Neutron Facility. Must be able to obtain and maintain a security clearance. Reactor Division.

4288. TECHNICAL POSITION - Requires AAS in mechanical technology or equivalent. Previous experience in a nuclear facility highly desirable. Duties will include the maintenance, installation, testing and troubleshooting of technical equipment or facilities. Must be able to obtain and maintain a security clearance. Reactor Division.

#### Motor Vehicles & Supplies

89 GRAND PRIX - 5 spd., SE pkg., all power, fully loaded, 20k mi., \$13,000. 689-9234.

87 BRONCO II XLT - 5-spd., ac, p/w, p/l, cruise, 30k mi., extended warranty, visor, running boards, alarm, more, excel. cond. Richard, Ext. 2231.

87 HYUNDAI GLS - 2-dr. h/b, m/t, 33 mpg, stereo cass., excel. running cond., \$3,000 neg. 289-7607, leave message.

87 FORD F-150 XLT - 4wd, H-D front & rear, trailer pkg., skid plates, cruise, tilt, auto 302, twin tanks, ac, red, 60k mi., mint, \$11,500. Ted, 765-5286.

86 QUAD 200 SX - 35 hrs., red & white, 5-speed + reverse, orig. owner, mint cond., \$1,000. Mike,

86 HYUNDAI EXCEL - 4-dr. h/b, 59k mi., 4-spd., new tires, excel. cond., \$1,500. Ext. 4567

86 TOYOTA COROLLA - h/b, 5-spd., p/s, p/b, am/fm stereo, ac, \$4,500. 286-3546.

85 TOYOTA TERCEL - h/b, 5-spd., ac, 2-dr., 47k mi., excel. cond, \$2,800 neg. 874-3927, Sat. & Sun. 85 MERCURY LYNX - 2-dr., 52k mi., good cond., \$2,000. Ext. 3102 or 3285.

85 BUICK SKYHAWK CUSTOM DX - p/s, p/b ac. sunroof, am/fm cass., eng. needs work, mint cond., best offer. Joe, Ext. 7507 or 744-3729

84 PONTIAC GRAND PRIX - a/t, ac, 100k mi.,

excel. cond., \$3,000. Alex, 289-2735. 84 CAMARO - V-6, 5-spd., T-top, am/fm cass.,

p/s, p/w, cruise, 49k mi., \$3,400. 654-2617. 84 PONTIAC FIREBIRD - black, tint windows, 6-

cyl., a/t, new tranny, high mi., excel. in & out, asking \$3,300. Marion, Ext. 2902 or 281-5667 eves. 84 RENAULT ENCORE - 2-dr., blue, 5-spd.,

am/fm cass., ac, new tires, good cond., \$900. 286-0913 after 6 p.m. 83 BUICK REGAL - 6-cyl., 4-dr., ac, p/b, p/s,

am/fm, 102k mi., new brakes & battery, good cond., asking \$2,000. Dov. Ext. 4389 or 282-3129. 83 DATSUN - am/fm, 115k mi., asking \$400. Bertrand, Ext. 3166.

83 FORD ESCORT - gold, good cond., asking \$800. Maria, Ext. 3033 or 744-1912 after 7 p.m.

82 BUICK REGAL SOMERSET - 2-dr., all power. am/fm cass., 65k mi., \$1,900. 363-6940 after 5 p.m. 82 PONTIAC GRAND PRIX - a/t, ac, 2-dr., p/w, \$2,200. Bert, Ext. 5156 or 581-4436.

82 MERCURY LYNX - good cond. in & out, good rubber. Frank, Ext. 3531 or 281-7578 after 5 p.m.

81 KAWASAKI 440 LTD - 12k mi., new brakes, tires, chain, sprockets, battery, sissy bar, v.g. cond., must sell, \$700. 474-5715.

81 CHEVY - a/t, p/s, p/w, am/fm cass., low mi., clean, \$1,700. 924-8143.

81 VW BARBIT LS - 2-dr., 5-spd., am/fm, runs well, some work needed, \$850 or best offer. Ext. 2914 or 286-3742 eves. or wknds.

80 DATSUN 210 - 5-spd., am/fm cass., 95k mi., runs well, \$350. Dong, Ext. 5510 or Ext. 3134 after

79 CHEROKEE JEEP - loaded, extra wheels & tires, orig. owner, excel. cond., asking \$3,500. Jeff, Ext. 2907.

79 CHRYSLER - 4-dr., V-8, a/t, ac, cruise, high mi new tires, brakes, exhaust, dark blue, good distance car, \$900. Tom, Ext. 4507 or 878-1060.

79 PONTIAC TRANS AM - V-8, a/t, ac, p/w, p/s, p/b, T-top, good cond., \$1,800 or best offer. Joe,

79 MOPED PUCH JAWA - 1k mi., baskets, excel.

cond., \$175. Keith, 474-3863.

79 PONTIAC - a/t, ac, 6-cyl., 2-dr., excel. cond., \$900 firm. 588-1251.

78 PONTIAC FIREBIRD - 4-spd., T-top, clean in & out, must sell, best offer. 744-2404.

78 CHRYSLER LEBARON - s/w, full power, tilt steering, 7.3k mi., good cond., \$1,000. 589-6803. 78 HONDA HAWK MOTORCYCLE - w/shield. Ed,

Ext. 7207 or 473-8716. 77 BUICK ELECTRA LTD - ac, p/s, p/b, p/w, p/t, cruise, am/fm, new exhaust, 108k mi., \$700 neg.

Yu-Shin, Ext. 4393/4563 or 582-2553 eves. 76 LANCIA SCORPION - mid-engine, 2-seater. John, Ext. 2788

76 TRANS AM - orig. owner, 400 cu. in., a/t, white, 86k mi., excel. cond., \$2,500; 4 Toyota tires & wheels for pickup, \$75. Ext. 3510.

74 VW - runs well, body needs work, \$75. Augie, Ext. 3884.

74 GMC PICKUP - %-ton, a/t, running, good tires & transmission, make offer. Tony, 698-9274. 73 SAAB - runs, \$100. Ext. 5262.

69 MUSTANG - convertible, aqua blue w/white top, 3-speed, low mi., good cond., many new parts, \$7,500. Darcy, Ext. 3362.

68 LINCOLN CONTINENTAL - needs work, \$550. Keith, 474-3863.

64 CORVAIR - 2-dr. Monza, \$695; '64 Corvair Spyder, free for parts. 744-3289.

MOTOR HOME - 24', 25k mi., TV antenna, ac, roll-up awning, \$17,500. Ext. 5070.

CHEVY - V-8 parts, Crane dual valve springs, Edelbrock valve covers, Moroso 9" air cleaner, stock cam, timing set, cheap. Glenn, 821-5165.

VAN WINDOWS - tinted glass w/screens, 1-21"wx31"h, \$35; 2-16"x21", \$20 ea.; aluminum backing rings. Bill, Ext. 4988.

V-6 RADIATOR - and shroud, small block C6, stall speed converter & flywheel. Wayne, Ext. 3084. RIMS - 1 w/D78-14 tire, 4-holes, \$7; 1 w/8.25-

14 tire, 5-holes. Ext. 2950. TIRES - 3, 195/75R14, one new, two used 5k mi., all on GM wheels. Tony, Ext. 3658 or 929-4903

TIRE - steel-belted radial Goodrich, P175/80R13 on Omni wheel, like new, \$20. Connie, Ext. 2594.

#### **Boats & Marine Supplies**

37' EGG HARBOR - 1967, sedan cruiser, galley down, flybridge, twin 350 repowered '80, UHF Loran, \$16,500, incl. summer dockage. 289-2320. 29' ULRICHSON - wood, FWC, flybridge, full galley w/oven, elec. head. many extras, must see, excel. cond., asking \$3,500. 732-2754.

22' TYLERCRAFT SAILBOAT - c/b, furling jib, Bimini top, sleeps 5, 6-h.p. motor, \$2,300. Sue, Ext. 7235 or 395-3529.

20' O'DAY SAILBOAT - galv. trailer, many extras, VHF radio, all sails, Johnson ob., sleeps 4, head, galley, \$4,500. John, 286-1331.

19' MARQUIS - V-hull, full canvas, '84 115-h.p. Johnson, s/s prop., low hrs., fishing or skiing, asking \$2,950. John, Ext. 2788.

19' BAYLINER BOWRIDER - 1988, 125-h.p. Force, p/tilt/trim, am/fm cass., low hrs., full canv trailer, in water, \$7,500. Ext. 7125 or 929-8641.

17' HYDROSTREAM - w/125-h.p., Easy Loader trailer, will separate, \$2,700. 821-2886

16' O'DAY - day sailer, on blocks, \$1,000. Elliot, Ext. 3947 or 475-3431.

14' RUNABOUT - fiberglass, w/35-h.p. ob., good cond., \$300. Tim, 281-7873.

13' BOMBARD - 1987, inflatable, '87 30-h.p Mariner, trailer, w/access., excel. cond., great scuba diving, must sell, \$3,500, 474-5715.

12' MFG RUNABOUT - fiberglass, can take up to 12-h.p. ob., car topable, extras, nice for fishing, asking \$650. John, 331-3724.

8' DINGHY - fiberglass. Dawn, 758-3830.

6' WINDSURFER - Mistral Superlight sail, North boom & mast, everything included, excel. cond., \$100.475-7369

OUTBOARD MOTOR - electric, MinnKota, 28 lb thrust, 5-spd., \$100. Ext. 7235

#### Furnishings & Appliances

DINETTE SET - 1 yr. old, oak, country, Windsor chairs, excel. cond., \$500. Murphy, Ext. 5459. DINING ROOM SET - Colonial, \$275; desk, \$20;

lace wedding dress, size 12, \$20. Ext. 4113. FURNITURE - living room, couch, 2 side tables, 2 lamps, excel. cond.; dining room set w/6 chairs

& covers, both Ethan Allan. Peter, 475-0831. SOFA - chair, upholstered, end table, earthtone, Scotchguard, 1 yr. old, \$400 neg.; antique brass light fixture, \$100, 929-5521.

CHAIRS - rattan, corner table. Dave, Ext. 5460.

BED - queen size, best offer. Joyce, 981-5696 WATER BED - king, pine w/bookshelf headboard,

excel. cond., \$225; washer/dryer, GE, excel. cond., \$225/both. Pete, Ext. 3868 or 878-1225.

TABLES - 1 cocktail, 2 end, wood, contemporary well made, excel. cond., \$150/all. Margaret, Ext. 2529 or 588-7989.

TABLE - wood, 17" tall, \$8; tabletop fan, 22" tall, \$8. Jessica, Ext. 2328.

FURNITURE - queen-size sofa bed, 1½ yr. old, \$150; tile-top table w/4 chairs, \$125; round table w/2 chairs, \$75 or best offer, 473-2098.

ELECTRIC LIFT CHAIR - blue tweed, excel. cond. Bill, Ext. 3531/4068 or 473-3171.

REFRIGERATOR - GE, compact, 1 cu. ft., 3 mo. old, \$75; 20" box fan, \$5; rocking horse, steel frame, \$15, 589-6803.

SHOWER DOORS - trackless, tub doors, bi-fold, almond color, new, in carton, \$110. Lou Pergola, Ext. 3499 or 732-1028.

AIR CONDITIONERS - GE, Sears, 8,500 Btu, \$95; 6,000 Btu, \$85; 4,000 Btu, \$80, all excel. Ext. 5076 or 744-4015

VACUUM - Regina Quick Broom, slightly used, works well on small areas, orig. \$60, sell for \$40. 924-2012, leave messag€.

WALL OVEN - Hotpoint, s/s, \$25; port. dishwasher, 18", Sears, \$100. 878-9369 after 6 p.m. WASHER/DRYER - apt. size, Kenmore washer, Whirlpool dryer, new pump & switch, \$100/both. Joe, Ext. 2214 or 924-7476.

CHINA - International, white w/yellow Oriental pattern, over 50 pieces, w/serving set. Joe, 924-

RANGE - Magic Chef, electric, 20", 4-burner, harvest gold, \$75, 728-4495.

#### Tools, House & Garden

LAWN MOWERS - Snapper, rider, 8 h.p., 6-bushel catcher, 30" cut, \$400; Sears 20" cut, 3½ h.p., rear bagger, \$65. Dan, Ext. 2012 or 698-7322. POOL PUMP - & filter, ½ h.p., like new, \$100. 744-2060

BELT SANDER - Craftsman, \$50; tap & die set, \$70. Ext. 3563.

HOT WATER HEATER - Beckett oil burner, two 275 gallon oil tanks, 289-0967.

LAWN MOWER - Chieftan w/Briggs & Stratton engine, \$35. Dave, Ext. 5460.

LADDERS - wood, extension, 28', \$20; 16', \$10; glass panels, 1'x3', alum. frame, good for greenhouse, etc., \$1/each. Victor, Ext. 2395.

POOL - Doughboy Timberline, 16', all disassembled, needs liner, make offer. Sue, Ext. 7235.

#### Sports, Hobbies & Pets

BICYCLES - 20" boy's, BMX style, red/black, \$35; 20" girl's, pink/white, \$45, both excel. cond. Paul, 727-4859

PUPS - Pekingese, AKC, male & female. Dan, 654-

REMOTE CONTROL AIRPLANE - never flown, orig. \$450, sell for \$250. Tommy, 447-1460.

FISH TANKS - 20 gallon, w/filter, gravel, wrought iron stand, fluor, hood, \$60, 10 gallon tank, gravel, heater, air pump, background, \$70. Bill, Ext. 2214.

MINT STAMP - 25¢; Eagle & Shield pressure sensitive coil, 609C, 30¢/each or \$5.25 strip of 18. Ext. 4841. WET SUIT - woman's, jacket & Farmer John,

Aquata, black, M/L, only used once, \$120. Jessica, R/C BUG - 1/12 Monster VW on Big Bear chassis. Futaba radio, Kyosho pack, Hobbico charger,

wood case, extras, \$150. Mike, Ext. 7160.

SCUBA EQUIPMENT - various. Ext. 3563. CLARINET - Bundy, w/case, recently serviced, excel. cond., \$125. Pete, Ext. 3868 or 878-1225

BICYCLE - Shogun, 12-spd., alloy frame & wheels, mint cond., \$225. Toni, Ext. 5257 POOL - 21' Doughboy, w/Perflex filter, needs

liner, \$200 neg.; 8mm movie camera, zoom lens, auto-iris, \$10; 8mm editor, \$15. Jack, Ext. 7869. TRANSMITTER - Heathkit, DX60, AM-CW. good

BICYCLE - girl's, 10-spd., used twice, \$60. Ext

CROQUET SET - 6-player, like new, used once orig. \$40, sell ofr \$25. Nancy, Ext. 5274.

COCKATIEL - 1 yr. old, beautiful yellow head, w/cage & book on care, all, \$75. Jim, Ext. 4617 RABBIT HUTCH - new, sturdy, \$40 Sue, Ext

#### Audio, Video & Computer

cond., \$40. Frank, 281-1457.

RADIO - Hallicrafter model 572, portable, 1951 best offer. O. Booker, Ext. 3082 or 727-5912

TELEVISION - Samsung, 13", remote control brand-new, still in box, orig. \$189, sell for \$150 Ext. 2683.

MONITOR - Hyundai, 12", monochrome, tilt & swivel, \$50. Ext. 3102 or 3285.

VCR - Sharp, remote control, good cond., \$150

COMMODORE CASE - new convert C-64 to 64C. new style, slimline case, \$26. Paul, 727-4859 STEREO COMPONENTS - Fisher CA270 ampli fier, fm 270 tuner, CR-W48 double cass, amplif

volume needs minor repair, \$50, 475-7733 RADIO - 2 each, 1930 vintage, will trade for Lionel or Marx trains. Jack, Ext. 7869.

MONITOR - color, 12" diag., needs work, \$25, antique console radio, GE, \$25. Victor, Ext. 2395. TELEVISION - Sharp, 19", color, remote control.

#### cable ready, moving, asking \$120. Sheu, Ext. 3770. Miscellaneous

TICKETS - 2, the Moody Blues, at Waterloo, N J., July 29. Tom, Ext. 2823.

2-PIECE OUTFIT - matching, size 7/8, \$10; baby clothes, 2-3 yr old, shorts, \$1; long pants, \$2, matching 2-piece, \$10-\$15. Warren, Ext. 4939

EGGS - range chickens; Gibson upright freezer

6 ladderback antique chairs, 363-7032 GRUNDIG CONSOLE RADIO - phono, \$25; maple desk, 42"x20", \$20; large lawn sweeper,

\$25; hand-push lawn mower, \$8, 878-6637. BAN SAW - tripod, sleeping bags, large trunk, electric motors, toy chest. 475-1254

LUGGAGE - Val Pac, matched, 28" suitcase, cosmetic case, \$20. Albert, 727-6481 SUITCASES - set of 2, matching, \$42, 1 plaid

suitcase, \$10. 475-4394. TYPEWRITER - IBM, electric, extra long carriage,

excel. cond., \$50. 929-4910 eves. TYPEWRITER - Olivetti, manual, excel. cond \$25. Ext. 5076 or 744-4615

TEDDY BEAR HAMSTERS - two, approx. 6 months old. Thomas, Ext. 3696 or 744-3069 CATS - Balanese. Ramona, 928-3088.

#### Yard & Garage Sales

WADING RIVER - multifamily sale, books, prints, fabrics, macrame supplies, coal stove, high chair, plants, auto parts, Sylvan Drive. Ext. 4050.

#### Car Pools

CENTER MORICHES - ride needed to BNL, will share expenses. Bob, Ext. 3932.

PLAINVIEW - Exit 43 LIE, need fourth driver. Elliott, Ext. 2495.

#### Lost & Found

FOUND - two golf clubs. Ext. 4309

#### **Real Estate** Real Estate advertised for sale or rent is available

without regard for the race, color, creed, sex or national origin of the applicant.

BELLPORT VILLAGE - 1-bdrm. upstairs apt., kit.-I/r combo, full bath, w/w, walk to village, beach, single, nonsmoker, no pets \$575/mo. + 1 mo. sec. Jim, 758-0393 after 6 p.m.

CALVERTON - 2-bdrm. townhouse, 11/2 baths, w/w, appl., patio, deck, \$750/mo. 878-0874 after

EAST MORICHES - 2-bdrm. apt., ground floor of Victorian house, bath, kitchen, d/r, l/r, large yard, 3 blocks to bay, shops, school, \$710/mo. + util. Mona, Ext. 5056 or 878-9384 eves.

GREENPORT - 2-bdrm. apt. in renovated Victorian, water view, 1 block to village, gar., w/d, deck. \$750/mo. Ed, 477-2814.

LEVITTOWN - 3-bdrm. dormered cape, eik, d/r I/r, den, priv. fenced yard, \$1,200/mo. + util. 29 5648 eves.

MASTIC - 1-bdrm. apt., kitchen-l/r combo, batri and priv. ent., \$475/mo. + elec. 281-1659 eves

MEDFORD - 1-bdrm. apt., I/r, eik, deck, pvt. ent., new carpet, 15 min. to Lab, no pets, children, \$550/mo. + elec. & sec. Bobbi, Ext. 2456 or 654-1993 after 5:30.

NORTH SHIRLEY - 1-bdrm. furn. apt., I/r, kit., w/w, priv. ent., 1 person, nonsmoker, no pets, 5 min. from Lab, \$500/mo. pays all. 281-8044.

PATCHOGUE VILLAGE - 1-bdrm. furn. apt., full kit, and bath, priv. ent., cable, \$550/mo. pays all. 289-7902

RIDGE - furnished studio apt., w/w, kitchen, bath, priv. fenced-in yard, 5 min. from Lab, nonsmoker, \$525/mo., avail. Sept. 1. Exit. 2673 or 744-8632.

RIDGE - furn. room, kit. privileges, share bath. nonsmoker, \$80/wk., 1 mo. sec. 929-4910 eves.

ROCKY POINT - furn. studio apt., full kit., bath, I/r-bdrm, combo, nice area, one person, nonsmoker, \$425/mo. incl. util. & cable. 744-8659. SHIRLEY - 1-bdrm. apt., eik, fp, l/r, furn./unfurn.,

waterview, walk to beach, cable, \$650/mo\_incl. all Matthew, 399-2989 or Pete, Ext. 5105. SOUND BEACH - 2-bdrm. ranch, 1 bath, I/r, d/r, eik, bsmt., w/d, Miller Place Schools, \$900/mo.

+ util. & sec. avail. 9/10. Ext. 3790 or 821-4553. WADING RIVER - 3-room apt., eik, full bath, one person, no pets, nonsmoker, \$500/mo. incl. all, avail. Sept. 8. Janet, Ext. 2345 or 929-3910.

CATSKILLS - 3-bdrm, chalet w/sleeping loft, fully furnished, near Hunter Mt. Music Festival and Catskill Game Farm, fishing, hiking, rafting golfing, etc. Kay, Ext. 4501 or Bea, Ext. 3642. CAPE COD, MA - 2-bdrm, condo, fully furn., deck,

waterfront, short walk to town & beaches, avail.

July & Aug., weekly rental, 399-3127

#### For Sale

CENTERPORT - 200' waterfront on Northport Harbor, 4-5 bdrm., 4 baths, 0.6 acre, \$595,000 Bob, Ext. 4044 or 261-3890.

CORAM - Tanglewood Hills, 4-bdrm ranch, 2 baths, 2-car gar, huge attic, gas heat, fenced, sewers, new carpet & paint, \$130,000. 928-7154

EAST MARION - beautiful 1 acre building lot. adjacent to Greenbelt. 325-0447.

EAST PATCHOGUE - 3 bdrm., 1 bath, I/r, eik, appl, full bsmt, ag pool, deck, P-M School District, \$122,000, neg 654-5609

JAMESPORT - 4 acre, walk to Sound, on culde-sac, beautiful area, price neg., terms avail. Kathy, Ext. 5312 or 929-8467

LEVITTOWN - 3-bdrm. expanded cape, large eik d/r, l/r, den, priv. fence, \$129,900 298-5648 eves MASTIC BEACH - 3-bdrm. ranch, det gar

w/Florida rm., low taxes, walk to water, \$87,500, rent while in contract. Sue, Ext. 7235 or 395-3529 MATTITUCK - 2 bdrm, full bsmt., gar., deck, porch, walk to beach, near marina, \$178,000 Dave, Ext 5460

MEDFORD PINES - 2-bdrm. expandable ranch, cedar den w/cathedral ceiling, skylights, wood stove, shop, solar HW, gar, Andersen windows. 1/J acre, 9 mi to Lab, \$120,000, 654-2617. MIDDLE ISLAND - Coventry Manor, 3-bdrm

townhouse, 2 baths, kit., l/r, d/r, laundry rm., cac

5 appl., patio, pool, tennis, carpet, ask. \$102,000. Rosalie, Ext. 3160 or 289-5704 after 5 p.m. MIDDLE ISLAND - Lake Pointe, 2 bdrm., I/r-d/r area, cac, gas heat, w/d, all appl., wood deck off master bdrm., pool, tennis and clubhouse, ask

\$77,500 neg. Bob, 924-7316. MIDDLE ISLAND - 3-bdrm. condo, 2 full baths, fenced patio, pool, tennis, wooded setting, cac, 6 min. to Lab, \$104,900. 878-2604 eves

RIDGE - 3-bdrm. townhouse, 1½ baths, cac, w/w

all appl., upstairs newly carpeted, encl. redwood patio, storage room, low monthly main., 5 min to Lab, price reduced to \$93,000. Mary, 924-4328. SHOREHAM - 3-bdrm. Colonial, 1½ baths, I/r, d/r, eik, den, fin., bsmt. w/sep. work room, gar, low taxes, 7 miles to Lab. \$169,000. 821-9513.

STONY BROOK - 3-bdrm. Colonial, 25 baths, 2 car. gar., 1/3 wooded acre, 5 min. to university & hospital, 3VSD, 751-8351.

BOICEVILLE, NY - in Catskills, 2-bdrm. house, English wood/coal stove in fieldstone enclosure. 4+ acres, woods and meadow, year-round brook. mountain views, many extras. 821-0469

HUBBARDTON, VT - 38 deeded acres on townmaintained road w/power, phone, view of Lake Bonnoseen, ask. \$39,000, neg. Tom,, Ext. 2823.

#### Wanted

VOLUNTEERS - normal, healthy, male/female, 18-50 yrs. old, for clinical research involving a radioisotope test, \$100 remuneration. Ext. 3672

DOG - tiny, short hair, Chihuahua or similar type. Chris, Ext. 4572, pp 0163 or 265-0163 after 5 p.n. OLD TURNTABLE - with cover or just the cover with minimum inside dimensions 151/4"w x 13"d

x 4"h. Munhofen, Ext. 4302. DOG CAGE - for medium sized dog, price below \$50. John, 928-8389 after 5 p.m.

COMPUTER - Commodore 64 system and/or component parts, used but in working condition. Pat, Ext. 2836.

Ads left out of this issue due to lack of space need not be resubmitted to appear in the next issue.